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UNITED STATES PATENT APPLICATION FOR

**EXERCISE MACHINE PRESS ARM**

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## BACKGROUND OF THE INVENTION

### 1. RELATED APPLICATIONS

*Dkt 31*  
This is a continuation of co-pending application serial number 09/271,689 filed March 18, 1999 (assigned U.S. Patent No. 6,080,091), which is a continuation of application serial  
5 number 08/895,517 filed July 16, 1997, abandoned.

### 2. FIELD OF THE INVENTION

This invention relates generally to the field of physical exercise equipment and, particularly, to a press arm for performing upper body exercises.

### 3. PRIOR ART

10 The bench press has long been a popular exercise for developing the muscles of the upper body. This exercise is traditionally performed in a supine position on a bench using a barbell. Within the last few decades, exercise machines have been developed with pivoting press arms coupled to a stack of weights that allow the operator to perform exercises from a seated position. Typically, the seat of the machine is adjustable so that shoulder press, incline  
15 press, chest press, and decline press exercises can all be performed using the same press arm.

A conventional press arm is pivotally attached to the frame of an exercise machine and has a pair of fixed handles for use by the operator. The operator pushes the press arm directly away from the torso during performance of the exercise. However, it has been found that a more thorough exercise can be achieved if the operator is able to move his or her arms  
20 inwardly (in what is commonly referred to as a "butterfly" or "fly" motion) as the press arm is pushed outwardly. Exercise machines have been developed to afford this additional component of movement. For example, U.S. Patent No. 5,437,589 discloses such a machine for performing shoulder, incline, chest and/or decline press exercises. While the apparatus

disclosed in the aforementioned patent provides a near optimal upper body exercise, the apparatus does not lend itself to incorporation in a relatively low cost multi-station exercise machine.

Some exercise machines have employed press arms with secondary pivots to provide the additional freedom of movement necessary for the operator to move his or her arms inwardly as the press arm is pushed outwardly. An example of such a device is shown in U.S. Patent No. 4,949,951 issued to Deola. This patent discloses an exercise machine with a press arm having forward extension members that are coupled to the press arm with universal joints. The extension members permit the user of the machine to perform a "dumbbell fly" movement. Owing to the universal joint between the extension members and the press arm, the extension members will naturally fall towards the floor if let go. This is inconvenient for the user of the apparatus and, further, requires that the user exert an upward force on the extension members simply to maintain them in position for performing an exercise.

Another example of a prior art exercise machine is shown in U.S. Patent No. 5,580,341 issued to Simonson. This machine for performing a shoulder press exercise has a pair of independent arms coupled to the machine by a primary hinge with a horizontal axis and respective secondary hinges. The design of the machine permits inward movement of the arms, but does not allow a true fly movement. The axes of the secondary hinges are preferably oriented at symmetric acute angles with respect to the primary hinge. This arrangement of the primary and secondary hinges operates to divide the exercise resistance into a longitudinal component and a lateral component. The lateral motion of the arms in Simonson's machine is limited outwardly by an interconnecting strap and inwardly by respective stops. These stops preclude anything more than a straight press or inward press movement during performance of a press exercise. Since outward movement of the arms is prevented by the stops, a full fly movement cannot be performed.

Still another example of a prior art machine is the Freedom Chest Press manufactured by Pacific Fitness Corporation. In a manner somewhat analogous to Deola's exercise machine, the Freedom Chest Press has a pair of extension members pivotally coupled to the main press arm. The extension members pivot about respective secondary axes that are perpendicular to the main pivot axis of the press arm. Outward movement of the extension members is limited by respective stops, and thus, as with Simonson's machine, a full fly movement cannot be performed.

Each of these prior art devices has certain disadvantages which are overcome by the apparatus of the present invention. One of the objects of the present invention is to provide an exercise machine offering combined press and fly movements without the use of stops to limit the amount of fly movement available to the user. Another object of the present invention is to provide exercise arms for performing the combined press and fly movement exercises that have a gravity-induced natural rest position corresponding to the starting position for such exercises.

Figure 1. The effect of the concentration of the *Agrobacterium* strain on the transformation efficiency of *Agrobacterium* strain 102. The concentration of the *Agrobacterium* strain 102 was varied from 10<sup>6</sup> to 10<sup>9</sup> cells/ml. The transformation efficiency was determined by the number of transformants per 10<sup>6</sup> cells of the *Agrobacterium* strain 102. The data are the mean ± SD of three independent experiments. The transformation efficiency was significantly higher at 10<sup>8</sup> cells/ml than at 10<sup>6</sup> and 10<sup>7</sup> cells/ml ( $P < 0.05$ ).

5 components. A main arm is pivotally coupled to the frame of the exercise machine at a main pivot in the same manner as conventional press arms. The main arm includes a cross-beam to which a pair of handle arms are pivotally coupled at secondary pivots. The axes of the secondary pivots are orthogonal to the axis of the main pivot and are inclined with respect to vertical when the press arm is in a rest position. This inclination causes the handle arms to  
10 assume a natural rest position under the influence of gravity. The rest positions of the handle arms place the press arm handles at a comfortable starting position for performance of a press exercise. Stops to limit the inward or outward travel of the handle arms are not necessary.



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[illegible]

## DETAILED DESCRIPTION OF THE INVENTION

In the following description, for purposes of explanation and not limitation, specific details are set forth in order to provide a thorough understanding of the present invention.

However, it will be apparent to one skilled in the art that the present invention may be practiced

5 in other embodiments that depart from these specific details. In other instances, detailed descriptions of well-known methods and devices are omitted so as to not obscure the description of the present invention with unnecessary detail.

With reference to **Figure 1**, exercise machine **10** is a special purpose exercise machine for performing press, fly and combination press/fly exercises. Exercise resistance may be  
10 provided by a selectable weight stack **16**. Other sources of exercise resistance may also be utilized, including individual weight plates, hydraulic, pneumatic, electromagnetic or friction mechanisms, or even the operator's own body weight. Although the present invention is illustrated as an exercise machine dedicated only to press and fly exercises, it is to be understood that the invention may also be embodied as part of a multi-station exercise machine  
15 in which a variety of individual exercise stations may be included in addition to the press arm as is well known to practitioners in the art.

Exercise machine **10** includes an upright frame member **12** and a top beam member **14**. A seat **18** for the operator of the exercise machine is attached to upright frame member **12**. Press arm **20** is coupled to top beam member **14** at main pivot **22**. Main arm members **24** are  
20 attached to transverse cross member **26**. A secondary pivot **28** is attached at each end of transverse cross member **26**. Handle arms **30** are pivotally attached to cross member **26** at pivots **28**. Pulleys **32** and **34** are rotatably mounted between main arm members **24**. Cable **36** is routed around pulleys **32** and **34** and also around pulley **38**, which is rotatably mounted on upright frame member **12**. One end of cable **36** communicates with the weight stack **16** or  
25 other suitable source of exercise resistance. The opposite end of cable **36** is attached to frame member **12**. Alternatively, cable **36** could continue on to communicate with additional exercise

stations in a multi-station embodiment. When press arm 20 is in use, forward motion of the press arm away from frame upright member 12 lengthens the path of cable 36 and thereby lifts the selected weights of the weight stack.

5 *Draw B2* As shown in **Figure 1**, press arm 20 is in its rest position. The axes of secondary pivots 28 are inclined from vertical by an angle  $\alpha$ . As a result of the inclination of the secondary pivot axes, handle arms 30 will assume a lateral rest position under the influence of gravity. As shown in **Figure 2**, the natural rest position of handle arms 30 in the lateral direction is generally straight down from pivots 28.

10 As handle arms 30 pivot about the respective secondary pivots 28, each point along handle arm 30 traces a circular path about the axis of rotation. The axes of the two secondary pivots are parallel to one another, and thus, the circular paths of corresponding points on the two handle arms 30 lie in a common plane. The axes of secondary pivots 28 are orthogonal to the axis of main pivot 22.

15 Still referring to **Figure 2**, each of handle arms 30 has a generally horizontal hand grip 44 and a generally vertical hand grip 46. As the operator performs a press exercise, hand grips 44 or 46 may be pushed straight out as in a traditional chest press exercise. Alternatively, the operator may also pull inwardly with a butterfly motion, causing handle arms 30 to rotate about secondary pivots 28. Resistance to such inward movement of the handle arms is provided by the weight stack or other source of exercise resistance since an incremental inward movement  
20 of the handle arms causes a corresponding incremental forward movement of main arm members 24 (assuming that the operator does not relax the forward pressure on the press arm and maintains the longitudinal position of the hand grips 44 or 46).

25 Referring again to **Figure 1**, handle arm 30 is inclined with respect to the secondary pivot axis by an angle  $\beta$ . The effective length of the handle arm is equal to  $(\sin\beta \times \text{actual length of handle arm})$ . A shorter effective length of the handle arms produces greater



resistance to inward movement of the arms. The same effect can be achieved by increasing the lateral distance between pivots 28. The exercise "feel" sensed by the operator depends on several factors, including the effective length of the handle arms, the actual length of the handle arms and the lateral distance between the secondary pivots. Angling the handle arms with respect to the axes of the secondary pivots assists in achieving a natural gravity rest position for the handle arms and yields a more compact design for the press arm than would otherwise be possible if the handle arms were designed to be perpendicular to the axes of the secondary pivots.

The lateral distance between pivots 28 is slightly wider than the lateral distance between the shoulder joints of a typical user of exercise machine 10. Also, as press arm 20 is pushed forward, the axes of pivots 28 will be near vertical at the end of the exercise stroke. The combination of these two design features results in a nearly ideal fly motion for the user of the machine.

As mentioned above, the operator of exercise machine 10 can select the manner in which a press exercise is performed. Some of the exercise movements available to the operator are illustrated diagrammatically in Figure 3. This figure represents an overhead view of exercise machine 10 showing the combination of straight press and press/fly combination movements that are available. Starting from the natural rest position of press arm 20, arrows 1 illustrate a straight press exercise. Arrows 2 illustrate a press exercise with inward fly movement. Finally, arrows 3 illustrate a full butterfly exercise in which the operator begins with handle arms 30 spread outwardly and then pulls inwardly and forwardly with elbows locked.

It will be recognized that the above described invention may be embodied in other specific forms without departing from the spirit or essential characteristics of the disclosure. Thus, it is understood that the invention is not to be limited by the foregoing illustrative details, but rather is to be defined by the appended claims.